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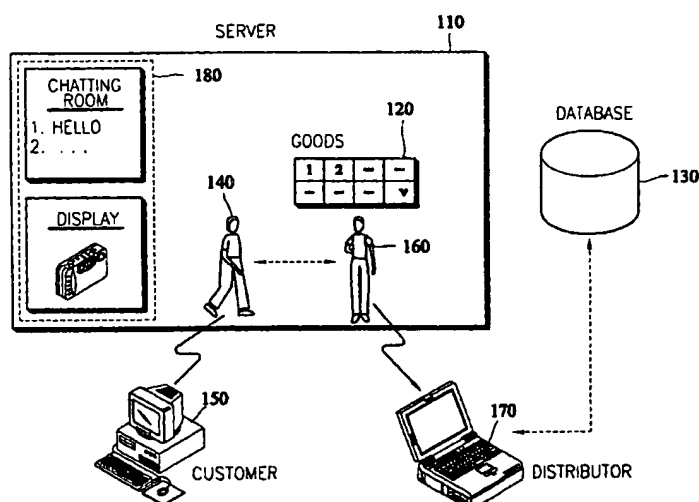
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(54) Title: ELECTRONIC COMMERCE SYSTEM AND METHOD OVER THREE-DIMENSIONAL VIRTUAL REALITY SPACE



(57) Abstract: An interactive electronic commerce system using intelligent virtual objects in a three-dimensional virtual reality space over a communication network such as the Internet, is provided. The interactive electronic commerce system includes a server, first and second intelligent virtual objects, first and second control units and an interface unit. The server is accessed by customers and distributors through a network such as the Internet and provides the three dimensional virtual reality space to the customers and distributors. The first intelligent virtual object is created by accessing the server. The first intelligent virtual object acts in the three-dimensional virtual reality space provided by the server under the control of an actual customer, and interacts with other customers or distributors. The first control unit is used by the customer to

control the first intelligent virtual object after accessing the server through the network. The second intelligent virtual object is created by accessing the server. The second intelligent virtual object acts in the three-dimensional virtual reality space provided by the server under the control of an actual distributor, and interacts with the customer through the first intelligent virtual object. The second control unit is used by the distributor to control the second intelligent virtual object after accessing the server through the network. The interface unit is provided by the server and allows the interaction between the first and second intelligent virtual objects. Accordingly, interactive electronic commerce can be accomplished in the three-dimensional virtual reality space similar to the real world, thereby overcoming the drawbacks of a conventional one-way shopping mall on an Internet homepage.

WO 01/11511 A1

## **ELECTRONIC COMMERCE SYSTEM AND METHOD OVER THREE-DIMENSIONAL VIRTUAL REALITY SPACE**

### Technical Field

5           The present invention relates to an electronic commerce system, and more particularly, to an interactive electronic commerce system using intelligent virtual objects in a three-dimensional virtual reality space over a communication network such as the Internet.

### 10   Background Art

          We are in the storm of the information revolution. We do not live in an industrial society any more, we now live in a information society. It is said that the Internet is a social medium like a telephone, and will provide various means of communicating in daily life, including a virtual world. Evidently, high-  
15   technologies of information communication rapidly come into our daily lives. Computers and information communication technologies are developing too rapidly to keep track of, so that no one can tell when or where new technologies will be developed. Particularly, the ongoing development of technologies related to cyberspace is incredible. As well as education,  
20   conferences, exhibitions and medical treatment, commercial dealings are made over Internet.

          Nations and companies all over the world pay attention to electronic commerce over the Internet and cyber shopping malls using electronic commerce. The cyber shopping mall collectively provides product information  
25   and a service for settlement of the price without limitation of time, place or distance, and also provides a delivery service when goods are digital products. Accordingly, the cyber shopping mall is convenient, saves customers time, reduces the cost due to the reduction of distribution steps, and allows companies to obtain inexpensive publicity. Thus, the cyber  
30   shopping mall becomes the center of interest among consumers and companies. Moreover, as some cyber shopping malls, for example, Amazon, become successful, consumers confidence in cyber shopping malls increases.

The success of some cyber shopping malls carries conviction for the success of the business to companies and thus, the market of Internet shopping malls rapidly grows.

However, the scale of the cyber shopping mall market is very small compared to the scale of the existing real market, although the growth rate of cyber shopping malls is high. Accordingly, the ratio of earning rate to investment is low in the present selling scale of cyber shopping malls, and the success of the business of the cyber shopping mall is doubtful. The absolute scale of electronic commerce does not come up to expectations although the number of Internet users rapidly increases and the expectation or estimation of the growth of Internet shopping malls is great. The main reason is that existing cyber shopping malls do not satisfy the demands on interactiveness which is the most advantageous merit of the Internet. The existing cyber shopping malls are constructed within two-dimensional homepages, in which information on goods is provided in a text form, or the goods are graphically illustrated with their prices to provoke on-line purchasing. In this circumstance, it can be said that consumers are forced to purchase the goods depending on only simple, unilateral information, without chances to get answers to questions and more detailed information about the goods. In other words, the existing cyber shopping malls are hardly different from the past primitive mail-order system, just providing photographs of the goods with their prices. In this state, it is difficult to expect an increase in sales. Recently, the shopping channels of cable television accomplish considerable sales. This is because consumers can obtain detailed information on goods by talking to guides over the telephone, and experts or famous people introduce the goods and explain about them in detail.

#### Disclosure of the Invention

To solve the above problem, an object of the present invention is to provide an interactive electronic commerce system and a method using intelligent virtual objects in a three-dimensional virtual reality space over a communication network such as the Internet.

To achieve the above object, the present invention provides an electronic commerce system including a server which is accessed by customers and distributors through a computer network, and which provides a three dimensional virtual reality space to the customers and distributors; a first intelligent virtual object which is created by the access to the server, the first intelligent virtual object acting in the three-dimensional virtual reality space provided by the server under the control of an actual customer, the first intelligent virtual object interacting with other customers or distributors; a first controller through which the customer controls the first intelligent virtual object after accessing the server through the computer network; a second intelligent virtual object which is created by the access to the server, the second intelligent virtual object acting in the three-dimensional virtual reality space provided by the server under the control of an actual distributor, the second intelligent virtual object interacting with the customer through the first intelligent virtual object; a second controller through which the distributor controls the second intelligent virtual object after accessing the server through the computer network; and an interface unit provided by the server, the interface unit allowing the interaction between the first and second intelligent virtual objects.

To achieve the above object, the present invention also provides an electronic commerce method including the steps of providing a three-dimensional virtual reality space equipped with a sales space of a predetermined area through a computer network; assigning a certain area among the sales space in the three-dimensional virtual reality space to an actual distributor, and arbitrarily constructing in the assigned area; creating a first intelligent virtual object when the distributor accesses the three-dimensional virtual reality space over the computer network, and controlling the first intelligent virtual object to act under the control of the actual distributor; creating a second intelligent virtual object when a customer accesses the three-dimensional virtual reality space over the computer network, and controlling the second intelligent virtual object to act under the control of the customer; and controlling the first and second intelligent virtual

objects to interact with each other.

### Brief Description of the Drawings

The above object and advantage of the present invention will become  
5 more apparent by describing in detail preferred embodiments thereof with  
reference to the attached drawings in which:

FIG. 1 is a graphical panoramic view illustrating the plaza of a shopping  
mall village according to an embodiment of the present invention;

FIG. 2 is a graphical panoramic view illustrating the inside of a  
10 shopping mall according to an embodiment of the present invention;

FIG. 3 is a graphic view of a Jurassic park according to an embodiment  
of the present invention;

FIG. 4 is a graphic view of a bicycle race track according to an  
embodiment of the present invention;

15 FIG. 5 is a graphical panoramic view illustrating the plaza of a shopping  
village according to an embodiment of the present invention;

FIG. 6 is a graphical, panoramic view of the interior of a shopping  
center in a shopping village according to an embodiment of the present  
invention;

20 FIG. 7 is a graphical, panoramic view of a living room in Bada's house  
according to an embodiment of the present invention;

FIG. 8 is a graphical, panoramic view of a shopping village viewed from  
a monorail according to an embodiment of the present invention;

FIG. 9 is a schematic diagram of an electronic commerce system in a  
25 three-dimensional virtual reality (VR) space according to an embodiment of  
the present invention; and

FIG. 10 is a schematic diagram of an electronic commerce system in a  
three-dimensional VR space according to another embodiment of the present  
invention.

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### Best mode for carrying out the Invention

To give an understanding of the present invention, the concept of

virtual reality (VR) will be described. A VR space is an imaginary cyber space which is constructed regardless of real world. In the VR space, the whole sensory organs of a human body are immersed in an artificially created world, so a person is under the illusion that he/she exists in the VR space himself/herself. In VR, a user can perceive objects, which do not actually exist, through visual sensation, auditory sense and tactile sensation as if in the real world, access information on the objects and transform the objects. The user in VR can lead every situation just as he/she has planned.

The starting point of VR is a technology making a user feel like he/she actually exists in a visualized space. It is known that VR originated from a machine called a Sensorama invented in 1962 by Morton Heilig, a photo artist and a film artist. The Sensorama, using an immersion technology, not a computer, allows a user to experience VR through a chair vibrating in accordance with projected images. Thereafter, a display apparatus, which is the father of the present head mounted display (HMD), was developed in 1965, based on a tri-view mirror invented in 1833 by Charles Wheatstone. VR technologies which do not use sophisticated equipment have been developed in the field of movies. In 1937, a certain movie company in Hollywood, United States produced "Third Dimension Murder" using red and green filters to thereby open the golden age of three-dimensional motion pictures. A certain game company developed three-dimensional spectacles, allowing images on a monitor to be visualized in three dimensions, using an infrared transceiver to overcome the limit of the heavy HMD. The company developed the three-dimensional spectacles ensuring almost complete three-dimensional images, thereby improving the visual aspect of VR technology. Present VR technologies go beyond the simple stage in which a person feels like actually existing in a visualized space and aim at making another world which is similar to the real world owing to the appearance of computers. For this purpose, researches are in progress in many fields such as artificial intelligence, simulation and computer graphics.

VR systems are classified as full immersion VR systems, desktop/vehicle VR systems or third person VR systems. These

classifications are based on a method of implementing VR and on the system elements. These systems are not completely separated but complement each other. Among the VR systems, it is the desktop/vehicle VR system that contributes most to the popularization of VR systems. In the full immersion VR system, a user wears basic gear to immerse in a three-dimensional space created by a computer and experience the world defined in the space. The full immersion VR system uses an HMD, a data glove, a space tracing apparatus, and a surround sound audio unit, etc. It can be said that the full immersion VR system is the most ideal form. However, users are under many restrictions when using the full immersion VR system. The economical restriction is the most influential. The full immersion VR system requires very expensive components, so it is difficult to be popularized. The full immersion VR system is usually used in laboratories in universities or related companies. The desktop/vehicle VR system uses images displayed on the monitor of a typical computer or projected by a stereo projector. This system lacks the sense of reality and other points compared to the full immersion VR system, but is used by many classes of users. The desktop/vehicle VR system can be easily implemented by providing a particular apparatus to a universal computer. NASA and many air lines in America operate this system, and in Korea, many companies use this system in education and research. The third person VR system uses a room in which a video display and a video camera are installed. In the room, a user interacts with objects in a virtual world created by a computer while watching the video display. Information on the appearance and movement of the user is transmitted to the computer through the video camera, and the image on the video display is reconstructed by way of composition previously planned. In other words, the user can operate with hands and feet the objects in a virtual world created by the computer through the video display, play an instrument, play simple sports or play games. The third person VR has many problems and needs complementation now, but is a very liberal scheme for a user. Therefore, the third person VR has great potential.

The future of the VR technologies will be group VR. At present, almost

all VR technology is based on individual use. Also in a VR over the Internet, the VR technologies are for an individual experience and do not support a VR in which many individuals interact with each other. However, it is expected that a group VR in which many individuals meet, talk and act together in a virtual space can be realized in the near future. If the group VR is developed, people can experience various changes in life. For example, two people at a great distance from each other can meet and go shopping together in a VR. The present invention results from research on the future of VR, and relates to an interactive electronic commerce system using group VR.

What will be changed if the concept of VR is introduced into construction? Construction started with human history. Construction provided not only shelter protecting humans from the weather, but also places for human activities which were newly required depending on changes in human civilization. Building has been accomplished in the real world until the industrialization age because the "real world" was the only space in which humans could perform construction. However, this situation has been changed as the information society comes. In the information society, a new space referred to as "virtual reality" is provided for humans. Virtual reality is achieved by representing physical situations, which can actually exist, in a virtual space. As a result, a new space in which humans can perform construction is created.

The present invention uses the Active Worlds program that was developed by Cof company in the United States for a platform for VR construction as a substitute for real construction, but should not be construed as being limited to the Active Worlds program.

The present invention results from a study in which buildings were designed and constructed in a virtual space using Active Worlds, which is a three-dimensional VR program, to understand the extent of implementation of VR construction to thereby investigate whether VR construction can accommodate every function of real construction. The results of the study provide various embodiments of the present invention. An embodiment of the present invention will be described focusing on electronic commerce most



actively utilized on the Internet at present.

The present invention providing the possibility of VR construction, defines a "shopping mall village" which is a type of mall in which various stores are housed in a series of adjacent buildings or one large building, and  
 5 a "shopping village" in which individual stores are constructed such that goods are actually displayed and traded in a virtual space.

#### (1) Shopping mall village

The shopping mall village includes a main plaza, a Jurassic park, a bicycle race track and a movie village located around a shopping mall. FIG.  
 10 1 is a graphical panoramic view illustrating the main plaza of the shopping mall village. For the shopping mall, a large number of stores are collectively located in one building, and actual business is accomplished in a web by linking a user to a homepage corresponding to a store. The Jurassic park is for providing learning and the bicycle race track is for providing entertainment  
 15 for the user. The user can watch movies and animations in the movie village. The Jurassic park, bicycle race track and movie village are separately located around the shopping mall in front of the main plaza to attract customers. The scale and contents of each facility are shown in Table 1.

Table 1

20	Shopping mall village	* Location: AIVR World in Active Worlds * Whole plottage: 40,000 m <sup>2</sup> (200 m × 200 m)	
	Facilities in village	Area	Content

1	Shopping mall	* Building area: 4,600 m <sup>2</sup> * Total floor area: 6,716 m <sup>2</sup>	* 1st floor-4,600 m <sup>2</sup> -65 stores (records, glasses, garments for men and women, bookstore, bags, shoes, flower, jewel, cosmetics and so on - Homepage link) -Event hall of more than 660 m <sup>2</sup> -5 teleporters * 2nd floor-2,116 m <sup>2</sup> -45 stores (car supplies, transport, cellular phones, PCS, computer, photo studio, air line, sports equipment and so on - Homepage link) -6 teleporters
2	Main plaza	900 m <sup>2</sup> (30 m × 30 m)	* Destination of World (Starting point)
3	Jurassic park	9,100 m <sup>2</sup>	* Dinosaurs of more than 10 kinds * Dinosaurs homepage link
4	Bicycle race track	3,000 m <sup>2</sup>	* 300 M race track * Obstacles at four locations
5	Movie village	4,500 m <sup>2</sup>	* Watching movies and animations -Movies: Mask of Zoro, Fifth Element, Broken Arrow, Armageddon, Gozilla, LA Confidential and so on -Animations: Princess Mononoke, Evangelion, Ghost in the shell, Akira, Laputa, Robot Taekwon V and so on * Guide on first-runners

The shopping mall is a two-story building and includes 110 stores of about 33 m<sup>2</sup> each and an event hall, thereby allowing one-stop shopping. If a user clicks the signboard or inside of a store, a corresponding homepage is opened and a trade is achieved therein. FIG. 2 is a graphical, panoramic view of the inside of the shopping mall. When a user enters the shopping mall, an announcement is heard with rhythmical music allowing the user to feel the dynamic atmosphere of a shopping center. A teleporter (an instantaneous transport unit) is used for movement to the second floor. Although steps or elevators can be provided in VR, a teleporter which is a fast shifter is provided

to give the user excitement which the user cannot experience in reality. When the user enters the Jurassic park, an announcement is also heard, and the sounds of walking and roaring dinosaurs allows the user to experience the actual feeling. Dinosaurs of more than ten kinds are linked to a homepage providing information on the dinosaurs, thereby giving the user a chance to learn. FIG. 3 is a graphic view of the Jurassic park. The bicycle race track is a recreational facility in which visitors from all over the World can enjoy bicycle racing together with bike avatars. The visitors on a start line start to race with a start sign from an official. The visitors take part in the bicycle racing hearing the real sound of running bicycles. FIG. 4 is a graphic view of the bicycle race track. The movie village provides more than 20 movies and animations for viewing. The user can watch what he/she likes using Quick Time or Real Player. The movie village also provides information such as a guide on hot new movies.

## (2) Shopping village

The shopping village includes clothing stores, the house of Bada who is a citizen of the World, a monorail through which a user can go on a tour of the World and a promenade located around a main plaza. FIG. 5 is a graphical, panoramic view of the shopping village. For the shopping village, a housing complex giving an atmosphere of a village is prepared. The shopping village is created to research the direction of the growth of a VR city in the future from various points of view. In the shopping village, goods are displayed and sold in stores without the support of homepages on a web. The stores are created focusing on particular goods, i.e., clothes. The house of the citizen is for a user who will act in VR, and for researching how the house in VR can be utilized and the possibility that the house can substitute for a personal homepage. The monorail allowing a user to go around the village is installed to inspect the necessity of a means of transportation in VR. The facilities and the scale of each facility are shown in Table 2.

Table 2

Shopping village	<ul style="list-style-type: none"> <li>* Location: Dobonggu World in Active Worlds</li> <li>* Whole plottage: 40.000 m<sup>2</sup> (200 m × 200 m)</li> </ul>
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	Facilities in village	Area	Content
1	Clothing shopping center	* Building area: 741 m <sup>2</sup> * Total floor area: 741 m <sup>2</sup>	* Clothing store selling women's suits (168 m <sup>2</sup> ) * Clothing store selling men's suits (180 m <sup>2</sup> ) * General store selling bags and shoes (208 m <sup>2</sup> )
2	Main plaza	1,600 m <sup>2</sup> (40 m × 40 m)	* Destination of World (Starting point) * Large ground compass * Teleporter/Information map of Worlds * Monorail stop * Mailbox
3	Bada's house (House of citizen)	* Building area: 160.6 m <sup>2</sup> * Total floor area: 246.6 m <sup>2</sup>	* 1st floor - 160.6 m <sup>2</sup> - Living room, Kitchen, Dining room, One bedroom * 2nd floor - 86 m <sup>2</sup> - Two or three bedrooms
4	Monorail	Installed at four places	* 425.5-M rail (three sections)
5	Promenade	Path of 8M in width	*100-M paths on the east and west

When a user arrives at the World, he/she selects where he/she wants to go on the information map of the World. The user can go there on foot or by teleporter by clicking where he/she wants to go. A mailbox is installed in the main plaza to obtain the opinions of users of the World. A large compass is provided on the ground of the plaza because it is difficult for a user to perceive direction in a virtual space. The clothing shopping center is a one-story building of 741 m<sup>2</sup> and is sectioned into three spaces including a clothing store selling women's suits, a clothing store selling men's suits and a general store selling bags and shoes. Goods are displayed in the clothing stores as if in the real world so as to give purchasers the pleasure of shopping. The purchasers can observe carefully the important points of the goods such as

sewing and dealing with the hem when purchasing clothing. FIG. 6 is a graphical, panoramic view of the interior of the shopping center in the shopping village.

In an embodiment of the present invention, a clerk can introduce goods to a customer in detail and bargain with the customer as in the real world. In other words, interactive commerce is possible through an interface such as chatting between a clerk and a customer through an avatar substituting for the clerk and an avatar substituting for the customer. In addition, the clerk can provide information such as graphics of goods to the customer when necessary. Moreover, a purchaser can choose clothing after seeing his/her appearance wearing the clothing, thereby decreasing refunds in electronic commerce. The purchaser can estimate goods after seeing the images of models wearing the goods using a Quick Time VR program. In brief, a three-dimensional shopping mall is constructed in a virtual space as in the real world, and sales people or guides standing by in the space show the goods using graphics or moving pictures with the detailed explanation of the goods through an interface such as chatting. In this virtual space, a purchaser can talk and bargain with a clerk as if he/she actually went to a store, thereby allowing the purchaser to buy the goods with confidence.

Products are sold best in domestic general shopping malls in the order of computers and electric home appliances, CDs (music and movies), software, household utensils (furniture and kitchen utensils), baby goods (toys) and gift sets (rib sets, honey, ginseng sets, neckties and purses). The reason that computers and electric home appliances are sold best is that they are standardized products whose quality is reliable to some extent without having to actually be seen, and that the price is low due to saving of the distribution margin. In a conventional one-way two-dimensional shopping mall, additional, detailed information on products cannot be provided to customers so that the mistrust by the customers of non-standardized products cannot be alleviated.

It was shown that domestic general Internet shopping malls greatly lack variety and information on goods. In a general shopping mall, the number of

displayed goods is more than 2,700 on average, and information on goods is usually just a price, a code and a color. With respect to surveyed enterprises, the average number of goods was 2,776, but the goods were not various except for the electronic appliances and computers. Information on goods is rarely provided in the general shopping malls. In specialty shopping malls, more information is provided on goods than in the general shopping malls. It is natural that the contents of existing usual Internet shopping malls are weak in organization, variety of goods and information thereon, because much cost and man power is needed to record various real goods on an Internet homepage. To provide information on goods possessed by a real shopping mall, not only text information must be recorded but also graphic information must be recorded by scanning the photographs of goods.

In the embodiment of the present invention, recording work needed in the conventional Internet shopping malls is not necessary. Some experts, educated on stores and goods as in the real world, search existing databases of goods for goods desired by customers, and explain and sell the goods to the customers according to their knowledge and sales approaches. For example, when a customer wants a particular product, a seller searches for information on the product using a computer and provides information on the product based on the result of search and his/her knowledge of the product, so that the customer does not need to search goods one by one. Moreover, when the customer wants to look at the product, the product can be shown through a digital camera in real time. Since goods can be shown through cameras installed in small stores or department stores, a great amount of information on goods does not need to be recorded in a homepage. Accordingly, through the present invention, information on all goods in the real world can be easily provided for customers, thus solving the problem of the existing Internet shopping mall lacking contents such as variety and information on the goods.

Human-to-human contact is most important in commercial business. Consider a situation in which commercial business is accomplished. When it is assumed that there is an unmanned store in which monitoring cameras

are installed and a customer is required to pay for goods by credit card according to proposed price information, will the sale be done well? The common features of the successful stores in reality are that the stores try to be friendly and give good service to the customers. Existing Internet shopping  
5 malls are just like the unmanned stores described above. In the existing systems in which goods are limited, information on the goods is not sufficient and friendliness is not felt, it is difficult to expect a great increase in selling. The embodiment of the present invention is a shopping mall of a new style, capable of solving the drawbacks of the existing Internet shopping malls.

10 The following description concerns the house of Bada (a person's name) who is a citizen. Basic space used by Bada is created in a two-story building. This is the place in which users of the World can communicate with Bada. Each room has a function to teleport a user to another room containing information on Bada's friends and family, Bada's hobbies and special talents,  
15 or Bada himself/herself. Through Bada's house, the possibility of a three-dimensional homepage in VR is researched. FIG. 7 is a graphical, panoramic view of the living room in Bada's house. The monorail is provided to research its possibility as a means of transportation by which a user can go around the village in addition to the moment shifter such as teleporters. Four stops are  
20 on the monorail. The monorail provides amusement to the users of the World when moving in the village. FIG. 8 is a graphical, panoramic view of the shopping village viewed from the monorail. Besides, promenades are created on the east and west sides of the village, thereby providing quiet places for the users.

25 (3) Differences between the shopping mall village and the shopping village

In the present embodiment of the present invention, the virtual space is divided into the shopping village and the shopping mall village, in both of which actual electronic commerce can be accomplished, using a three-  
30 dimensional VR program, and the possibilities of VR construction are inspected from various points of view. The differences between the principal features of the shopping mall village and the shopping village are shown in

Table 3.

Table 3

	Shopping mall village	Shopping village
5 Structure	<ul style="list-style-type: none"> <li>* Equipped with additional facilities centering around a specialty shopping center having more than 110 stores</li> <li>* Additional facilities: Bicycle race track, Jurassic park, Movie village</li> </ul>	<ul style="list-style-type: none"> <li>* Organized with single store and house, a place for refreshment, transportation and buildings creating the atmosphere of the village</li> <li>* Single store: Men's suits, Women's suits and a general stores</li> <li>* House organized to have the function of a personal homepage</li> </ul>
Display and purchasing of goods	<ul style="list-style-type: none"> <li>* Each store of 40 m<sup>2</sup> has a signboard, and goods are displayed such that a customer can recognize the contents of major goods.</li> <li>* Each store is linked to a corresponding homepage.</li> <li>* In each homepage on a web, detailed information on goods are obtained, and a customer purchases goods.</li> </ul>	<ul style="list-style-type: none"> <li>* Goods are individually displayed in a single store of more than 160 m<sup>2</sup>.</li> <li>* Good are more effectively publicized through Quick Time or Real Players.</li> <li>* Detailed information on goods is obtained and purchase of goods is accomplished through display and a clerk in VR.</li> </ul>
Merits	<ul style="list-style-type: none"> <li>* Since various kinds of stores are collected in one place, quick and convenient shopping is possible.</li> </ul>	<ul style="list-style-type: none"> <li>* Since a customer can carefully observe goods before purchasing them, and a clerk sells the goods as in the real world, the customer can buy the goods with confidence.</li> </ul>



Effect of additional facilities	<ul style="list-style-type: none"> <li>* The additional facilities provide various amusements for customers.</li> <li>* Other users having purposes other than shopping can be accommodated.</li> </ul>	<ul style="list-style-type: none"> <li>* The atmosphere of an actual village gives users a friendly feeling.</li> <li>* Since users can go around the village by monorail, the users can easily understand the structure of the village.</li> </ul>
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5 Besides, VR construction can be applied to the following fields.

(1) Facilities for viewing such as virtual museums and art galleries

In museums or art galleries in the real world, curators prudently determine the order of arrangement of exhibits and guide visitors. The visitors see the exhibits arranged according to a classification such as period, artist,  
10 school or chronology, but the exhibits in a museum or a gallery are not all there in a certain field. Since exhibits of the museum or art gallery in the real world are displayed within a limited space, the volume of exhibits is also limited. On the other hand, space is not limited in a museum or an art gallery in VR. Moreover, in a virtual gallery, visitors can see architecture which is not  
15 preserved at present or which is not constructed yet as well as existing exhibits. Viewers can see voluminous exhibits one by one using personal computers. In addition, the viewers do not need to wait, and can appreciate works in a museum or an art gallery of a maximum scale if they can access VR through computers anywhere in the world. The scale of a building is not a  
20 question in VR. Instead, the capacity of a server and the width of a network are important. Examples in which visitors can see artwork on a web homepage are often found on the Internet at present. However, visitors can see only artwork in reduced scale in homepages on the web so that the feeling of reality is decreased and it may be difficult for the visitors to understand the  
25 artwork. On the other hand, in a gallery constructed in VR, visitors can see exhibits on the same scale as in the real world. Therefore, any artwork can be exhibited, and visitors can enjoy the artwork vividly in VR.

(2) Education facilities

At the beginning of 1990, campus networks in schools had already

been generalized. Users could exchange their opinions through e-mail and share with and obtain from people at a large distance, the knowledge of professional subjects through on-line conference. In education facilities in VR exceeding the existing method, users can exchange their opinions and take  
5 lessons face to face, and take lessons which the users want anywhere in the world. In addition, the campus of a school can be created in a virtual space. Students and professors will talk while walking in the campus created in VR.

### (3) Virtual theater and cinema

As the Internet comes into daily life, a user can search for videos  
10 through the Internet and watch videos, the television and a music concert. However, this information is also one-way. Players cannot hear a roar of applause of viewers. To overcome the unbalance between players and viewers, an audience in a studio, a public opinion census or calls from the viewers was utilized, but this was just a temporary measure. A virtual theater  
15 through a network can overcome the unbalance between players and viewers. Even if the players and viewers are far away from one another, the viewers can see the players doing their performance in a virtual theater created in VR when the viewers access VR through the network. A viewer sees the performance through the eyes of an avatar, which is a character substituting  
20 for the viewer so that the viewer can vividly enjoy performances with the feeling of reality.

### (4) Office

As the use and construction of information through a network is activated, people manage business through computers. If an office is created  
25 in VR, an individual enters the office through a computer at his/her house. The individual talks with other colleagues who came to the office for work and deals with business or takes part in a meeting. The individual can do business with customers face to face in VR, thereby obtaining the trust of the customer. In business related to bank or stock, the Internet is actively utilized,  
30 and the range of business managed through the Internet will increase. By adopting VR, the number of employees working at home will increase.

### (5) Amusement facilities

Amusement is one of the fields which will progress most actively in VR. A user can go to famous tourist resorts or rest areas, where he/she cannot go in the real world, any time in VR. The user can view the scenery of a tourist resort or a rest area, which is created to be identical to the corresponding place in the real world, while walking therein. The user can experience various things such as mountain climbing, ski, bungee jumping and paragliding. The user can also experience various things which he/she cannot experience. Space which is created by the unlimited imagination of humans in VR can provide humans with amusement which the humans have not experienced until now. A user can easily experience various things which he/she cannot experience due to limit of time and money through VR technology.

Various events, research or voting can be performed in a three-dimensional virtual space. A user can also enjoy games or chatting in the three-dimensional space. Since VR is implemented in three dimensions which are the same as the dimensions of the real world where people live, it can be said that the range of application of the VR is substantially unlimited. Although VR technology is in the first step, it is studied in various ways, so VR construction will deeply influence our daily lives before long. Although VR construction and real construction have the same basic concept of constructing a space in which humans can live, their contents are different. For example, things necessary in real construction may not be necessary in VR construction, or things which are not important in real construction may be important in VR construction.

The VR space has some physical features different to the real world. The most different feature is that there is no gravity in VR space. Since there is no limitation by gravity, an architect can construct any shape of building in VR space without structural limitation. However, it is preferable to control gravity such that humans can recognize and perceive buildings as in the real world, in VR. Moreover, virtual space in VR is cyber space over a network and thus, virtual space is not influenced by climate. Accordingly, equipment which is essentially required in a building in the real world is not necessary in VR. In virtual space, a user can momentarily move to a place he/she wants to go

using a teleporter, an instantaneous transport method, in virtual space in addition to a method of using a means of transportation or walking on foot. This can be the reason that virtual space must be differentiated from the real space. When an architect constructs a building in virtual space taking into  
5 account other physical conditions, the architect must notice the hidden functions of real building space. For example, the teleporter removes the necessity of steps or corridors, and rest rooms are not necessary either in virtual space. However, it is necessary to consider other functions than a passage function of the steps or corridors. Individuals meet, exchange their  
10 information and make human interchange while they move through the steps or corridors. Individuals living in or using VR experience VR through computers connected to a network. If individuals talk with others through the monitors of computers without meeting one another face to face most of time, and use the teleporter when moving all the time in VR, the human interchange  
15 may disappear. To overcome this problem, steps or corridors are required in VR. Therefore, an architect must create a space suitable for humans to live with consideration of functions needed in VR construction even if the functions are not necessary in real construction, by understanding the hidden functions of real construction. A restroom can be another example. An avatar which is  
20 an existence substituting for an individual in virtual space does not need to go to the restroom. However, in the real world, the individual goes to a restroom in the course of working through a computer. The individual may meet and talk with a fellow worker for a moment or take a rest to feel comfortable even if busy. In this case, the avatar needs to go to a restroom in VR before the  
25 individual goes to the restroom in the real world. If not, the avatar stays at the same place while the individual in the real world has gone to the restroom, and this may confuse other users. Even if a function is not essentially needed in VR, when the function in the real world influences VR, a space having the function must be reconstructed to be suitable for VR.

30 As in the real world, an effective flow system must also be established depending on the characteristics and function of a space in VR. As an architect designs an effective space for human life in the real world, it is

natural that an architect designs a space for human life in VR.

Research on construction in three-dimensional VR space and the analyzed results thereof have been described. The following description concerns an electronic commerce system according to a preferred embodiment of the present invention. FIG. 9 is a schematic diagram of an electronic commerce system in a three-dimensional VR space according to an embodiment of the present invention.

There is a server providing a three-dimensional VR space (hereinafter, referred to as a world) 110 over a computer communication network such as the Internet. It has already been reviewed that various facilities in addition to the shopping mall or the shopping village can be constructed in the world 110 by the server.

In this virtual space, a distributor who wants to sell goods previously registers in the server to have a store of a predetermined area and displays goods 120 in the store with reference to the store in the real world. The distributor accesses the server using a communication and control unit 170, such as a personal computer, in the store of the real world, through the Internet. During the access to the server, usual user authentication and password verification is performed. After successfully accessing the server, an intelligent virtual object (hereinafter, referred to as an avatar) 160 which acts in the world 110 on behalf of the real distributor is assigned. The distributor controls the words and behaviors of the assigned avatar 160 using the communication and control unit 170. The distributor will control the avatar 160 to go to his/her store to wait for customers. According to an implementation scheme, the avatar 160 can be positioned at the corresponding store at an initial access state if the user is registered as a distributor. Since a plurality of stores exist in the world 110, distributors individually access the server using their communication and control units 170 in their stores in the real world, and wait for customers in their own stores.

When a customer, who knows there is the three-dimensional VR space 110 over the Internet, accesses the server using a communication and control unit 150 such as a personal computer through the Internet, an avatar 140 is

assigned to the customer as is assigned to the distributor. The customer can go around the world 110 by controlling the assigned avatar 140 using the communication and control unit 150. The customer can see the world just as a 'visitor' or register as a citizen of the world 110. When the customer registers as a citizen of the world 110, he/she is provided with various functions through which he/she can conveniently use the world 110. Since there are various additional facilities as well as a shopping center in the world 110, customers may access the server due to the attraction of the additional facilities not the shopping center. The number of customers who can simultaneously access the server is restricted by the capacity of the server only. A plurality of customer avatars 140 will go around the world 110 as if in the real world.

The server provides an interface unit 180 between customer avatars 140 or between a customer avatar 140 and a distributor avatar 160. When necessary, interfacing between distributor avatars 160 is possible and multiple interfacing among a plurality of avatars is also possible. The interface unit 180 includes a character and/or voice chatting function. Although only the character chatting function is shown in the drawings, it will be understood by those skilled in the art that voice chatting is possible if the communication and control units 150 and 170 are equipped with microphones and speakers. In other words, conversation between customers or between a customer and a distributor can be accomplished through the avatars 140 and 160. It is not preferable that all the avatars in the world 110 talk with one another in a single chatting room. It is preferable to divide the world into blocks of a predetermined size such that only avatars in the same block can talk with each other. One of ordinary skill in the art will be able to define blocks and establish a chatting group in each block in various ways. Accordingly, in addition to the function of a shopping mall, the world 110 can provide a chatting space like that provided by a bulletin board system (BBS) or a meeting place for network users.

A modified embodiment of the present invention may include a function of an avatar controlling the position, action and movement of a particular

avatar. Although the avatars 140 and 160 are individually controlled by the control units 150 and 170 of users, respectively, it may be necessary that the action of a particular avatar (hereinafter, referred to as an A avatar) is synchronized with that of another avatar (hereinafter, referred to as a B avatar) under the permission of the other. In this case, the A avatar can be controlled through the B avatar. This can simulate two people going shopping hand in hand in the real world. One of ordinary skill in the art will understand a specific method allowing this control.

The following description concerns the commerce business between a customer and a distributor, which is the most important function in the embodiments of the present invention. A customer may look for a particular commodity or may just be looking around. When the customer avatar 140 enters a particular store selling the particular goods 120 while going around the world 110 where the distributor avatar 160 is waiting for the customer avatar 140. The customer avatar 140 can look through the particular goods 120, ask some question about the goods 120 of the distributor avatar 160, or bargain over the price with the distributor avatar 160. In the existing two-dimensional electronic shopping malls, information on goods is one-sidedly provided through a homepage. This one-way characteristic does not accord with reality. The embodiment of the present invention overcomes this problem by allowing two-way interfacing between a customer and a distributor.

In addition, because the customer avatar 140 can interactively talk with the distributor avatar 160 in the store, it is not necessary to record specific information on all the goods 120 in the limited space of the store. In the existing two-dimensional shopping malls, since information on goods is provided one-way, the complicated structure of a homepage is unavoidable to provide all possible information, and the volume of information is limited due to a limited capacity. Moreover, a customer himself/herself must search a homepage for necessary information. In the embodiment of the present invention, a customer can obtain necessary information by asking a distributor, thereby minimizing the volume of information on goods displayed in a store. When the customer avatar 140 asks a question, the distributor can provide the

necessary information referring to a database 130 through the distributor avatar 160. The database 130 may be just the knowledge of the distributor on the goods, or may be constructed as a separate database for a store of a large scale. Moreover, a commodity can be digitally photographed by a camera  
5 installed in the real store and displayed in real time to a customer through the interface unit 180 provided in the world 110. In the case of a clothing store, the function of the interface unit 180 can be extended such that a customer can wear a sample of clothing before determining whether or not to purchase it. It is the unique merit of the world 110 that information requested by a  
10 customer is provided in real time.

FIG. 10 is a schematic diagram of an electronic commerce system in a three-dimensional VR space according to another embodiment of the present invention. The embodiment of FIG. 10 is similar to the embodiment of FIG. 9, with the exception that the embodiment of FIG. 10 includes a plurality of  
15 customers and customer avatars 140 through 140m, a plurality of distributors and distributor avatars 160 through 160n, and a plurality of stores and databases 130 through 130n. In FIGS. 9 and 10, the same reference numerals denote the same member. Reference numerals 120 through 120n denote goods sold in each store. Reference numerals 150 through 150m  
20 denote control units for controlling the customer avatars 140 through 140m, respectively. Reference numerals 170 through 170n denote control units for controlling the distributor avatars 160 through 160n, respectively.

FIG. 10 clearly illustrates a sales space 190 of a particular area provided in the world 110. The total sales space 190 of the world 110 is  
25 divided into lots and sold or rented to distributors. In FIG. 10, the areas of the stores are the same, but different areas of the stores may be assigned to the individual distributors depending on the needs of the individual distributors. Each distributor can display goods in an assigned store according to his/her own strategy. If the assigned space is allowed to be used for any purpose  
30 without restriction, a distributor can construct a virtual building within the assigned space.

Although the invention has been described with reference to particular



embodiments, it will be apparent to one of ordinary skill in the art that modifications of the described embodiments may be made without departing from the spirit and scope of the invention. The embodiments of the present invention should be construed in descriptive sense only and not for purposes  
5 of limitation. The scope of the invention is set fourth in the following claims.

#### Industrial Applicability

According to the present invention, interactive electronic commerce can be accomplished in a three-dimensional VR space similar to the real world,  
10 thereby overcoming the drawbacks of a conventional one-way shopping mall on an Internet web page. In addition, a user in the world of a VR construction can do every thing he/she can do in the real world. Individuals can meet, talk or dance with others and bargain over the price of goods with each other. They can go to the movies or a theme park hand in hand and enjoy leisure  
15 facilities. If a user goes to school in VR, he/she can ask a teacher questions and have answers from the teacher in real time as if he/she actually is in a classroom of the real world. The user can go around a city in VR by monorail or take part in a motor race. According to the present invention, things which are impossible on a homepage of an existing two-dimensional web site can be  
20 accomplished as if in the real world.

What is claimed is:

1. An electronic commerce system over a three-dimensional virtual reality space in a computer network, the system comprising:

a server which is accessed by customers and distributors through the computer network, and which provides the three dimensional virtual reality space to the customers and distributors;

a first intelligent virtual object which is created by the access to the server, the first intelligent virtual object acting in the three-dimensional virtual reality space provided by the server under the control of an actual customer, the first intelligent virtual object interacting with other customers or distributors;

first control means through which the customer controls the first intelligent virtual object after accessing the server through the computer network;

a second intelligent virtual object which is created by the access to the server, the second intelligent virtual object acting in the three-dimensional virtual reality space provided by the server under the control of an actual distributor, the second intelligent virtual object interacting with the customer through the first intelligent virtual object;

second control means through which the distributor controls the second intelligent virtual object after accessing the server through the computer network; and

interface means provided by the server, the interface means allowing the interaction between the first and second intelligent virtual objects.

2. The electronic commerce system of claim 1, further comprising a database of information on goods sold in the three-dimensional virtual reality space, wherein the second intelligent virtual object provides the information on goods in real time through the interface means at the request of the first intelligent virtual object.

30

3. The electronic commerce system of claim 1, wherein a plurality of first intelligent virtual objects, that are controlled by a plurality of first control

means, exist, and the interface means supports interfacing among the first intelligent virtual objects, wherein a particular first intelligent virtual object can control the position of another first intelligent virtual object so that the positions of both intelligent virtual objects are synchronized in the three-dimensional virtual reality space.

4. The electronic commerce system of claim 1, wherein the interface means comprises at least one selected from the group consisting of voice chatting means, character chatting means and display means.

10

5. An electronic commerce method in a computer network, the method comprising the steps of:

providing a three-dimensional virtual reality space equipped with a sales space of a predetermined area through the computer network;

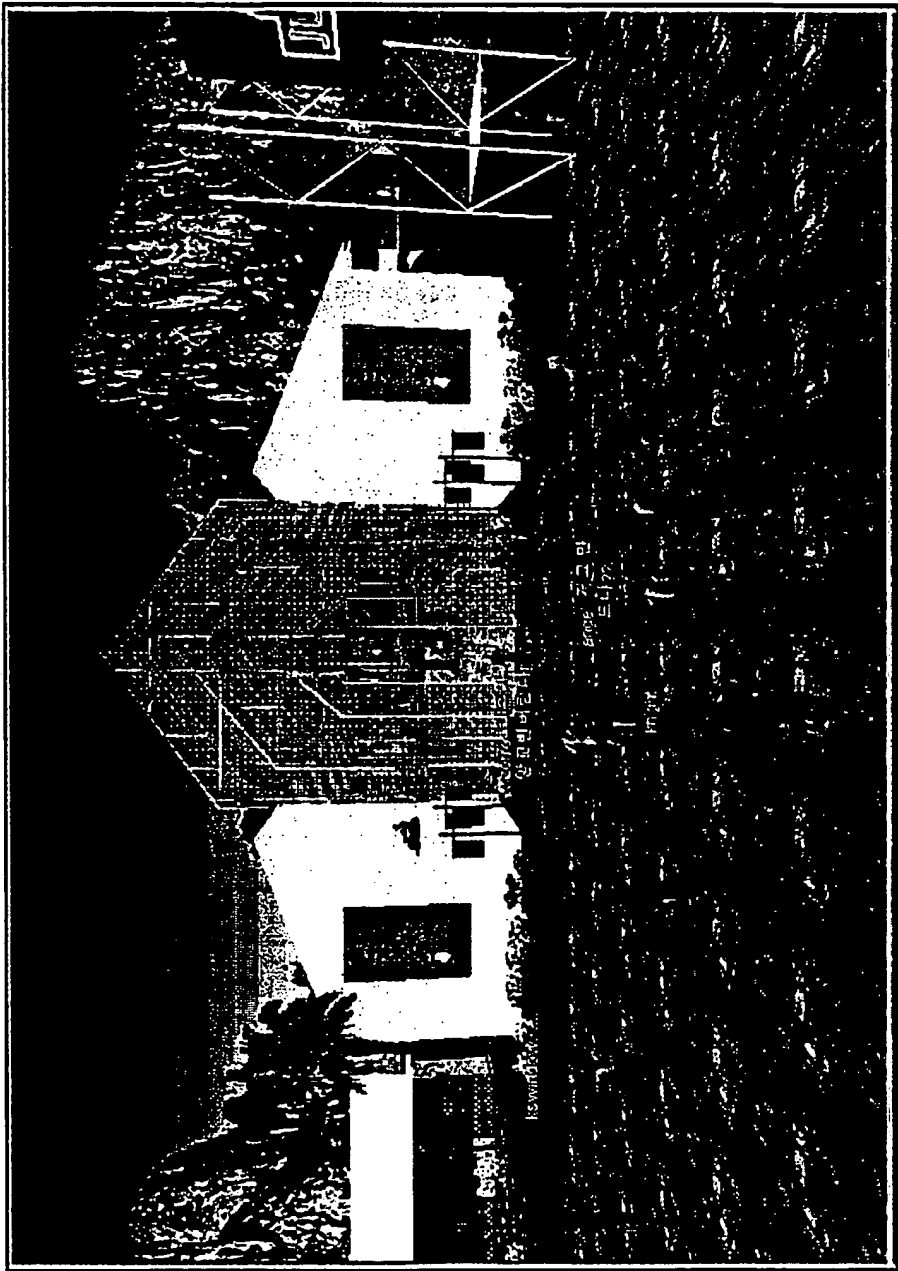
15 assigning a certain area among the sales space in the three-dimensional virtual reality space to an actual distributor, and arbitrarily constructing in the assigned area;

creating a first intelligent virtual object when the distributor accesses the three-dimensional virtual reality space over the computer network, and  
20 controlling the first intelligent virtual object to act under the control of the actual distributor;

creating a second intelligent virtual object when a customer accesses the three-dimensional virtual reality space over the computer network, and controlling the second intelligent virtual object to act under the control of the  
25 customer; and

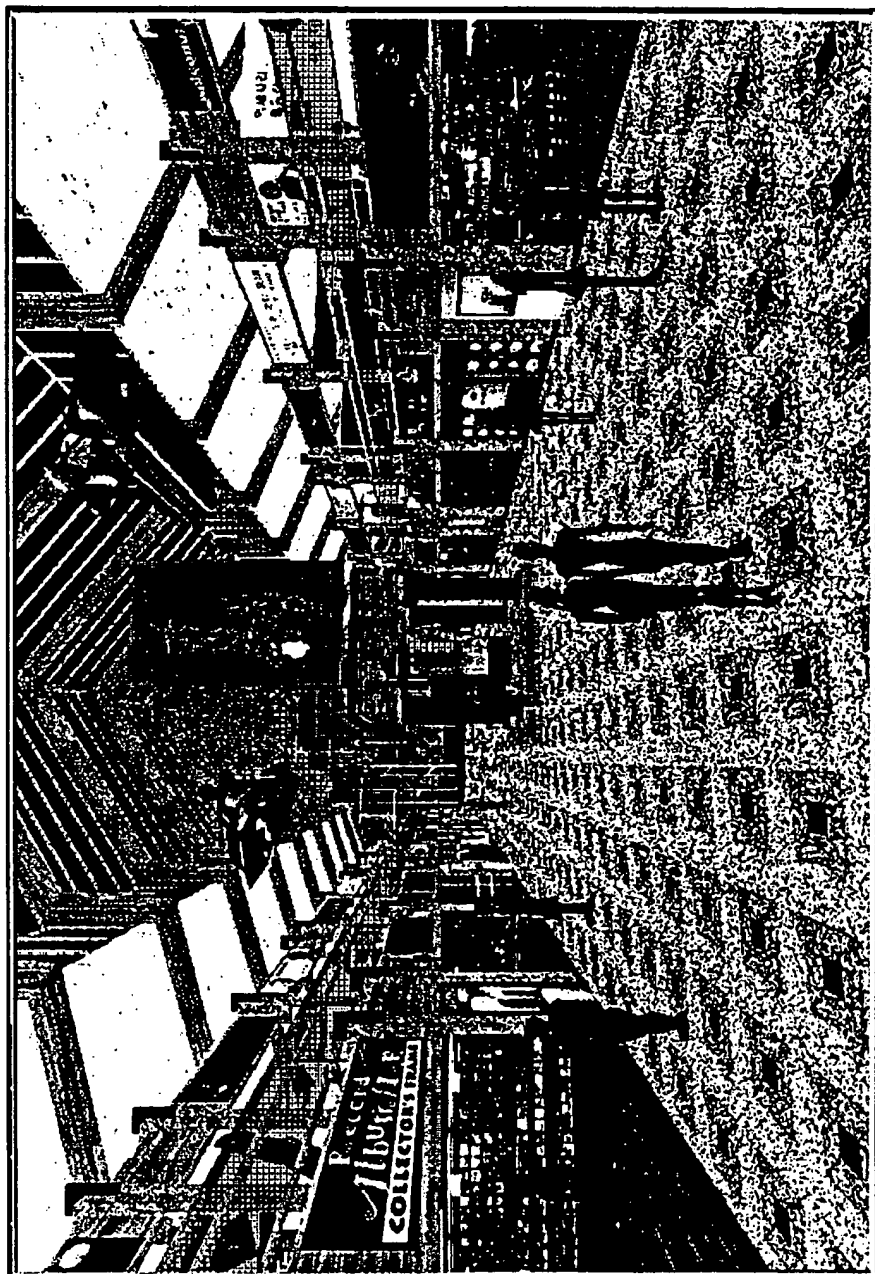
controlling the first and second intelligent virtual objects to interact with each other.

FIG. 1



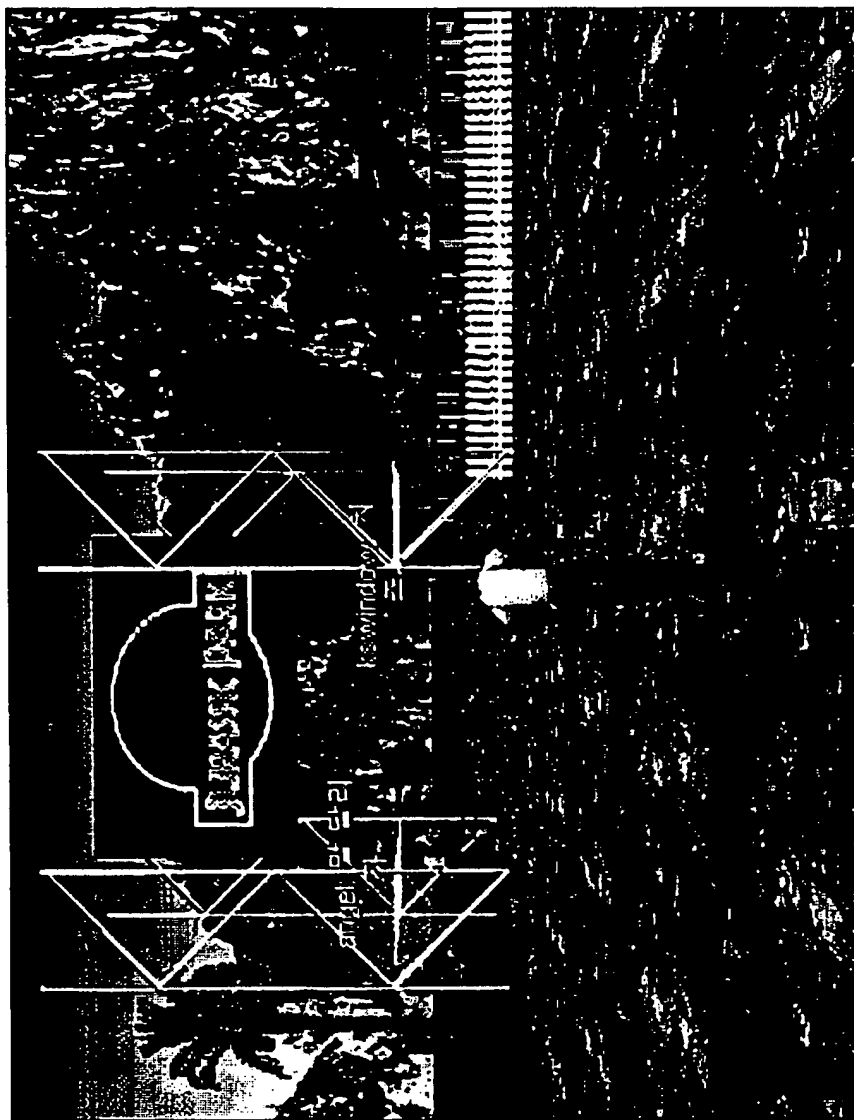
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FIG. 2



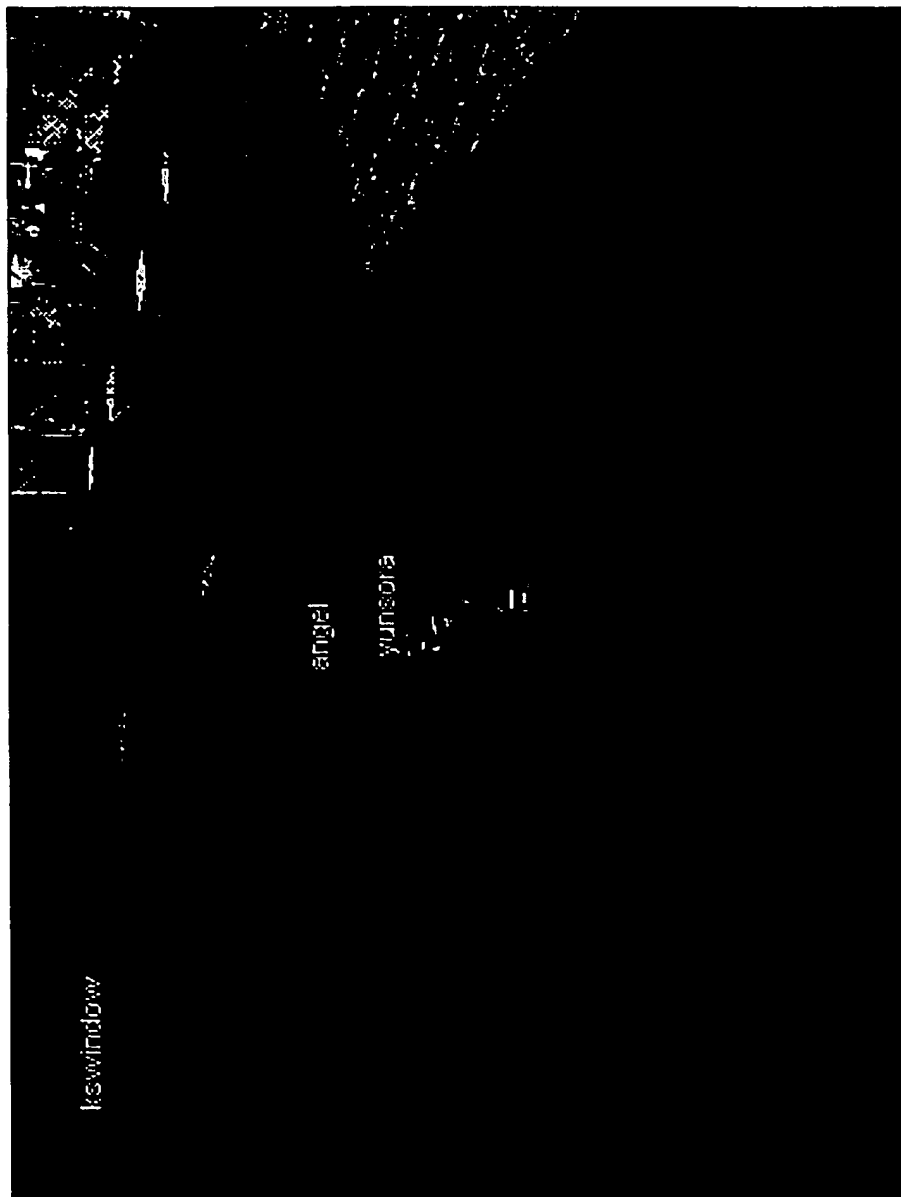
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FIG. 3



4/10

FIG. 4



5/10

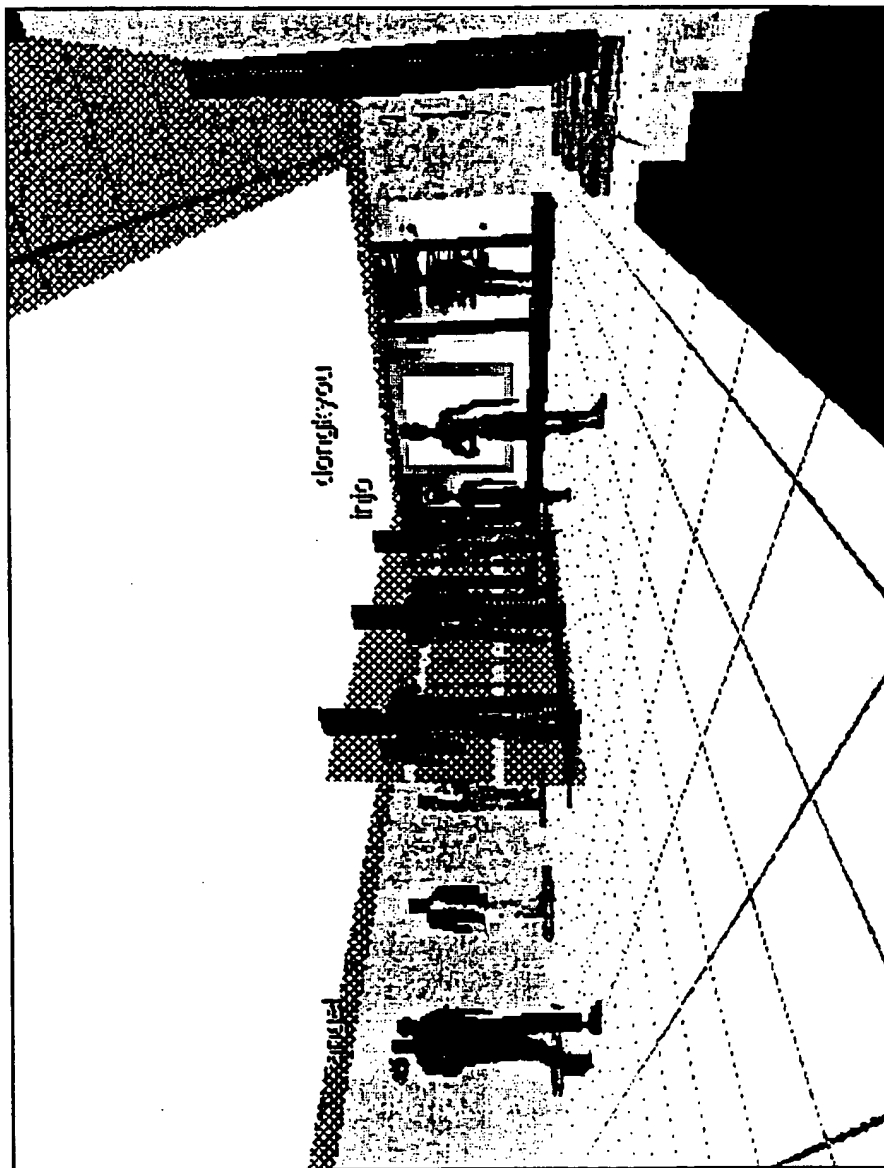
FIG. 5





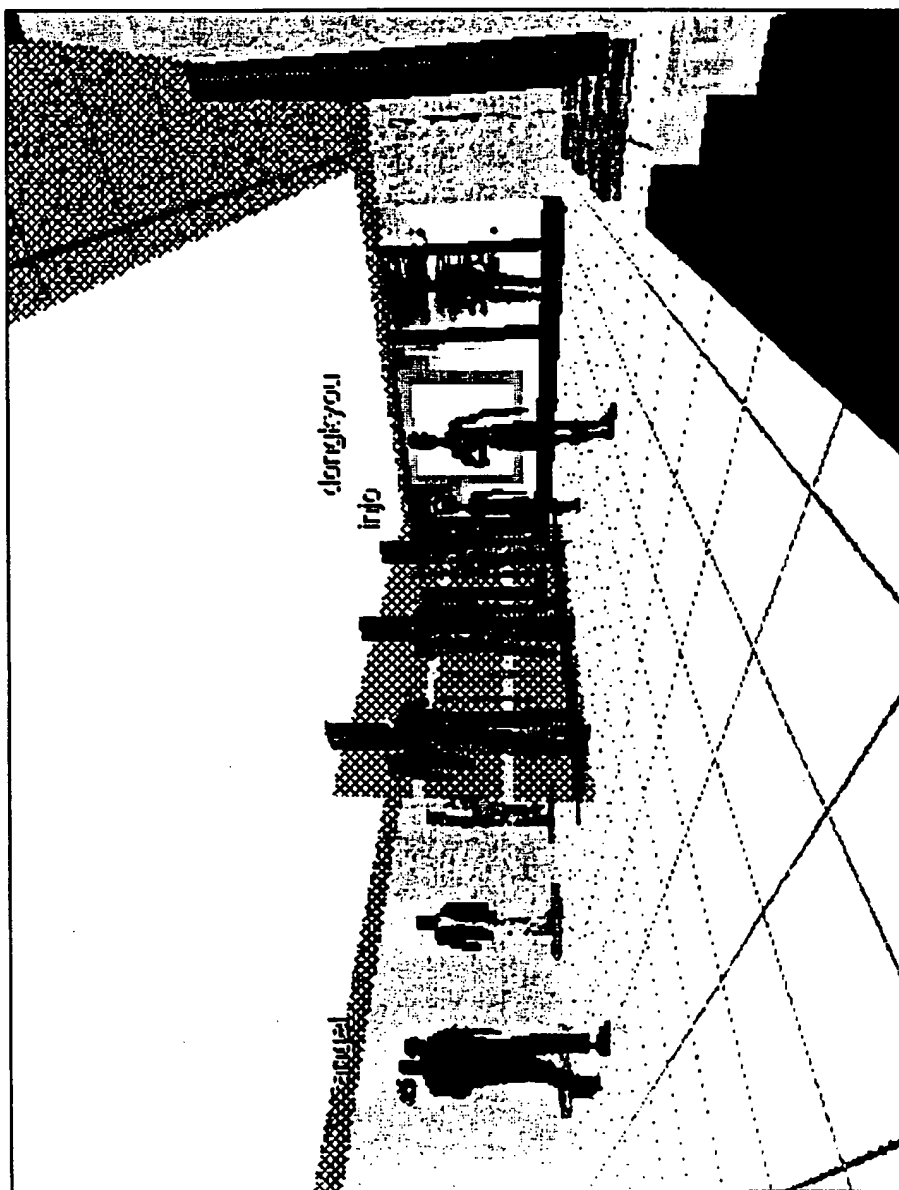
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FIG. 6



7/10

FIG. 7



8/10

FIG. 8

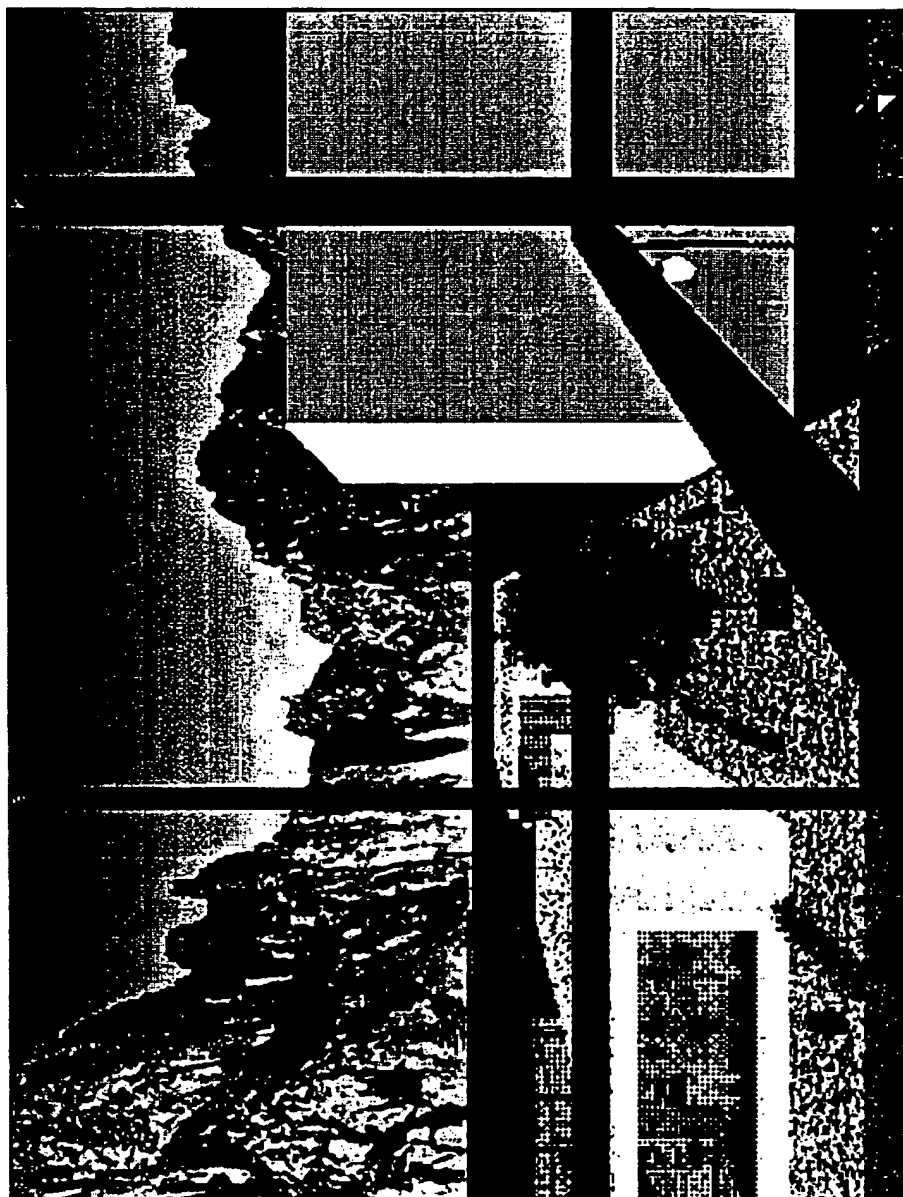
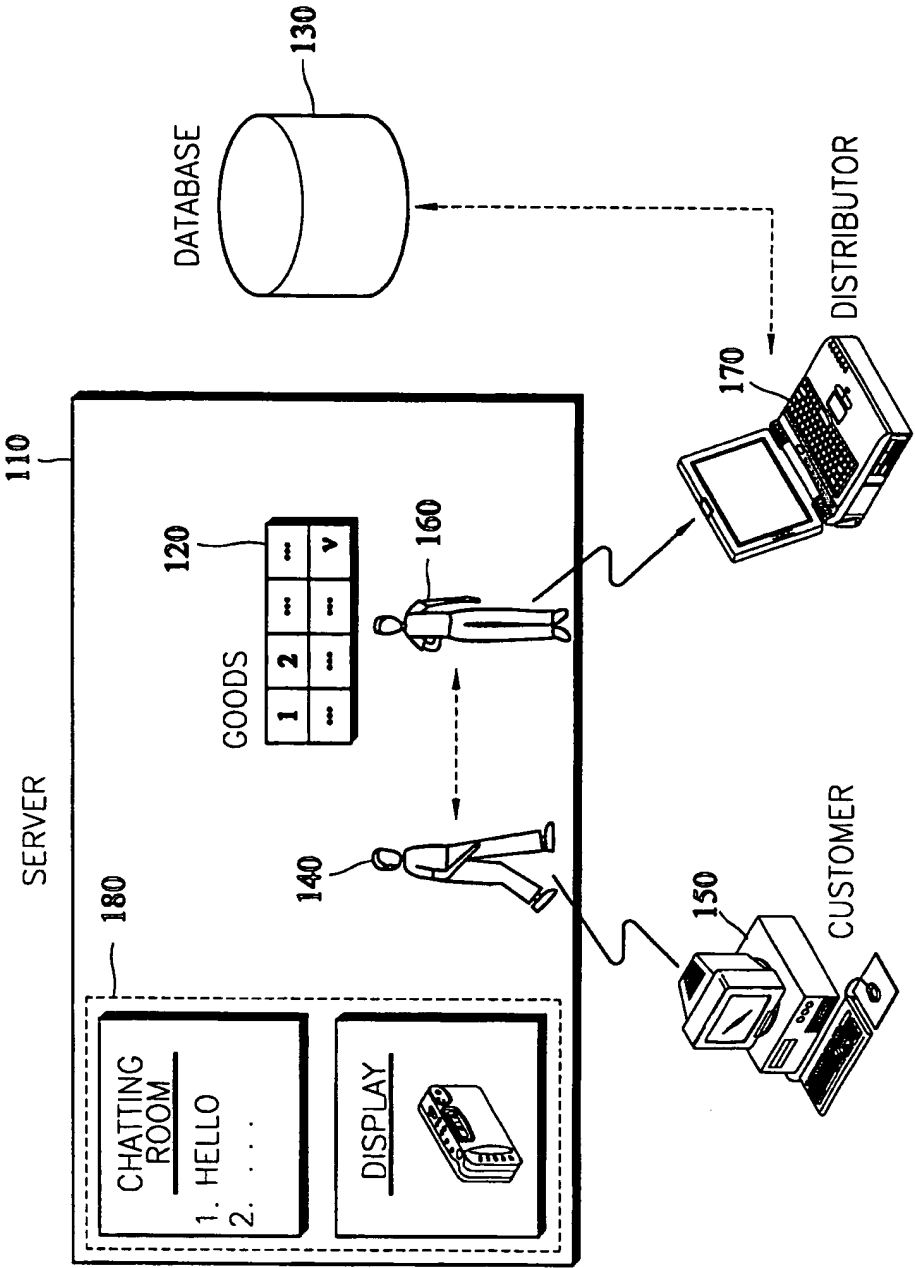
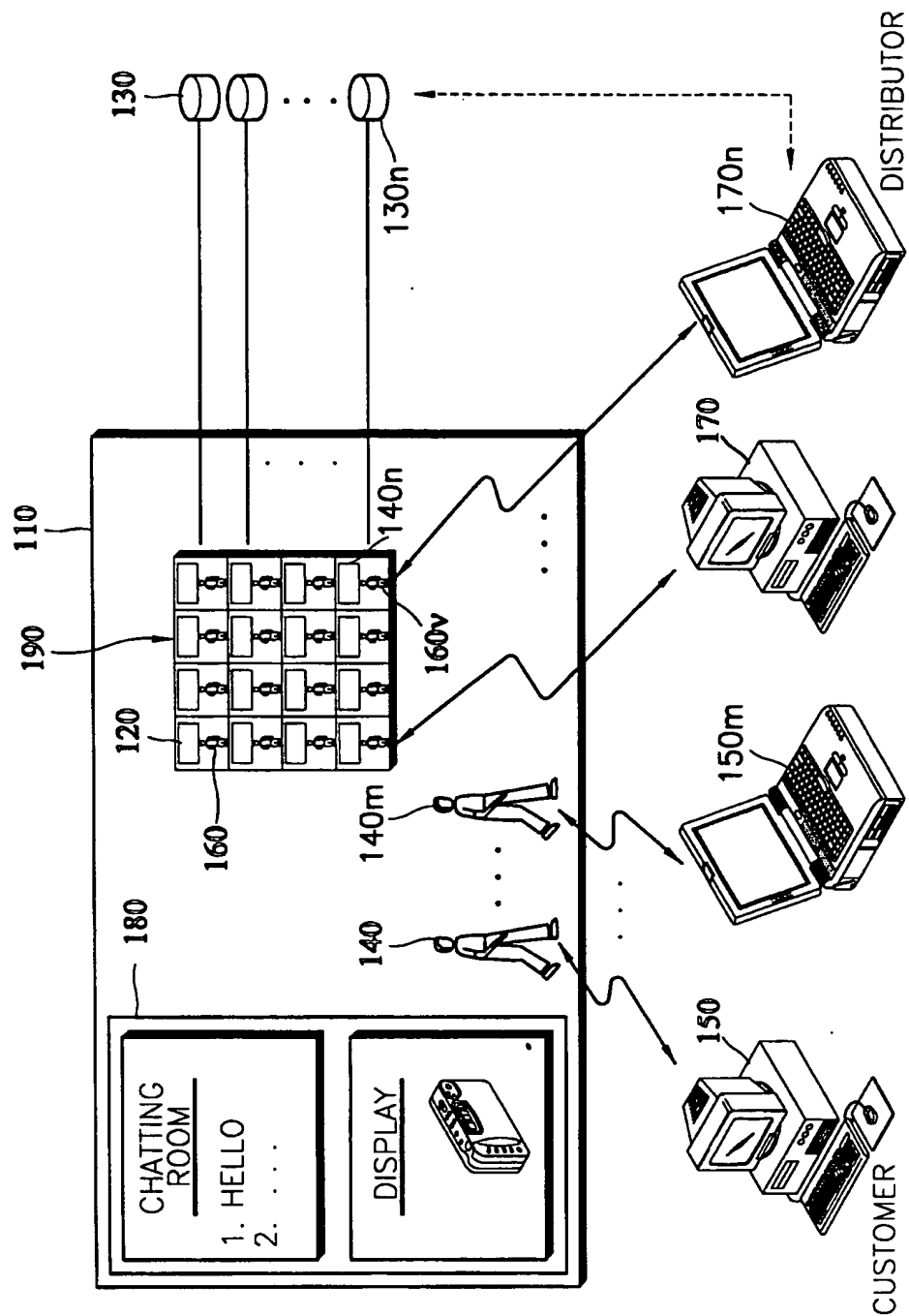


FIG. 9



10/10

FIG. 10



## INTERNATIONAL SEARCH REPORT

 International application No.  
PCT/KR00/00596
**A. CLASSIFICATION OF SUBJECT MATTER****IPC7 G06F 17/60**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC7 G06G17/60, IPC7 G06F 13/00, IPC7 H04M 11/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 822535 A (AT&T CO.) 1. AUGUST 1997 FIG 1, 2, 3 ABSTRACT, CLAIMS 1,3,4,7, 9-13, 17-21	1-5
Y	JP 11-85889 A (KEIDA) 30. MARCH. 1999 FIG 1, 2(a)(b) ABSTRACT, CLAIMS 1, 2, 3, 4, 5	1
A	US 5347306 A (MITSUBISHI ELECTRIC RESEARCH LAB.) 13. SEPTEMBER. 1994 FIG 1, 2, 3 ABSTRACT, CLAIMS 1-3, 7-14	1-5



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&amp;" document member of the same patent family

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25 SEPTEMBER 2000 (25.09.2000)

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